



Algebra I

14 questions	12 questions	17 questions	17 questions	8 questions	12 questions
Number Sense	Statistics, Data Analysis, Probability	Algebra and Functions	Measurement and Geometry	Math Reasoning	Algebra I

Twelve of the 80 CAHSEE multiple-choice questions are based on 10 of the Algebra I standards.

WHAT DO THE ALGEBRA I STANDARDS ASK ME TO DO?

To answer the CAHSEE Algebra I questions, you'll need to know how to:

- recognize equivalent forms of polynomials and other algebraic expressions
- understand the meaning of *opposite*, *reciprocal*, *root*, and *absolute value*
- identify the graph that matches a particular linear function and find its slope and intercepts
- know that lines on a graph are parallel if and only if they have the same slope
- solve linear inequalities
- solve problems involving rate, average speed, distance, and time
- identify the solution to a system of two equations in two unknowns
- solve classic algebra rate, work, and percent mixture problems

Vocabulary

The words below have appeared on the CAHSEE during past administrations. If any of these words are unfamiliar to you, look them up in the CAHSEE Math Vocabulary list in the appendix at the back of this Study Guide, or check with your math teacher.

absolute value

slope of a line

y -intercept

parallel

x -intercept

WHY IS ALGEBRA I IMPORTANT?

The Algebra I standards expand and deepen basic algebra skills included in the grade 7 Algebra and Functions strand. Many people working in technical, scientific, and health-related jobs need a working knowledge of Algebra I. The anchor problem for this strand, *Restaurant Advertising*, shows how a restaurant manager might use algebra on the job.

In the U.S. today, algebra has become a “gatekeeper” subject even in fields that don’t actually use much algebra on the job. The reality nowadays is “if you don’t know algebra, you don’t get into either the University of California system or the California State University system.” Knowing the basics of algebra enables you to keep your future options open.

HOW WILL THE CAHSEE TEST MY KNOWLEDGE OF ALGEBRA I?

The CAHSEE tests 10 of the 29 standards from the Algebra I strand. Let’s start by looking at 5 of these standards and some actual CAHSEE questions based on them. Each box that follows contains one of the standards, a sample question based on that standard, and a solution with an explanation.

1A2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, and taking a root, ~~and raising to a fractional power~~. They understand and use the rules of exponents. [1 question] (Note: The crossed out portion will not be tested on the CAHSEE.)

Sample CAHSEE Question

If $x = -7$, then $-x =$

A -7

B $-\frac{1}{7}$

C $\frac{1}{7}$

D 7

M02863

Mathematical Solution

- From the given information, substitute x with -7 .
- $-x = -(-7) = 7$
- Therefore, the correct answer is **D**: 7.

Descriptive Solution

The correct answer is **D**. If $x = -7$, then $-x = 7$, because “ $-x$ ” means “take the opposite of x .” Because $x = -7$, the opposite of -7 is 7. Number pairs that are opposites add to 0; therefore, the opposite of -7 is 7 because $-7 + 7 = 0$.

Number pairs that are reciprocals multiply to give 1. For example, 7 and $\frac{1}{7}$ are reciprocals because $7\left(\frac{1}{7}\right) = 1$. Choice B is incorrect; it is the reciprocal of -7 .

1A3.0 Students solve equations and inequalities involving absolute values. [1 question]

Sample CAHSEE Question

If x is an integer, what is the solution to $|x - 3| < 1$?

- A $\{-3\}$
- B $\{-3, -2, -1, 0, 1\}$
- C $\{3\}$
- D $\{-1, 0, 1, 2, 3\}$

M03035

Mathematical Solution

- $|x - 3| < 1 \rightarrow$

$$\begin{array}{r} \text{Solve: } x - 3 < 1 \\ +3 \quad +3 \\ \hline x < 4 \end{array}$$

$$\begin{array}{r} \text{and solve: } x - 3 > -1 \\ +3 \quad +3 \\ \hline x > 2 \end{array}$$

- So, $2 < x < 4$; therefore, the correct answer is C.

Descriptive Solution

Let's test the numbers in each set of x -values to see if they make $|x - 3| < 1$ true. Check choice A by putting in -3 for x . Is $|-3 - 3| < 1$? No, it is not, because $|-3 - 3| = |-6| = 6$, and 6 is not less than 1, so choice A is wrong. Also, you now know choice B is incorrect, because -3 , which made choice A incorrect, is in the set of choice B.

Next let's try choice C. If x is 3 then $|x - 3| = |3 - 3| = |0| = 0$. Because $0 < 1$, choice C could be the answer, but we still need to check to see if choice D might be even better. Try letting x be -1 first. Then $|x - 3| = |-1 - 3| = |-4| = 4$. But 4 is not less than 1. So D cannot be the answer. Therefore, the correct answer is C.

Another way to analyze this problem is to use the fact that the absolute value of a number is the number's distance from 0 on the number line. So, if the absolute value of $x - 3$ is to be less than or equal to 1, then $x - 3$ must be between -1 and 1. This gives two inequalities: $-1 < x - 3$ and $x - 3 < 1$. Solving each of these inequalities you get that $2 < x$ and $x < 4$. So, x must lie between 2 and 4. The only integer that is both greater than 2 and less than 4 is 3. So, the correct solution set is $\{3\}$.

1A4.0 Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$. [2 questions]

Sample CAHSEE Question

Which equation is equivalent to $\frac{x+3}{8} = \frac{2x-1}{5}$?

- A $5x + 3 = 16x - 1$
- B $5x + 15 = 16x - 8$
- C $8x + 3 = 10x - 1$
- D $8x + 24 = 10x - 5$

MI3117

Mathematical Solution

- Multiply the left and right sides of the equation by 8 so that it cancels.

$$\frac{8(x+3)}{8} = \frac{8(2x-1)}{5}$$

$$x+3 = \frac{16x-8}{5}$$

- Multiply the left and right sides of the equation by 5 so that it cancels.

$$5(x+3) = \frac{5(16x-8)}{5}$$

$$5x+15 = 16x-8$$

Therefore, the correct answer is **B**.

Descriptive Solution

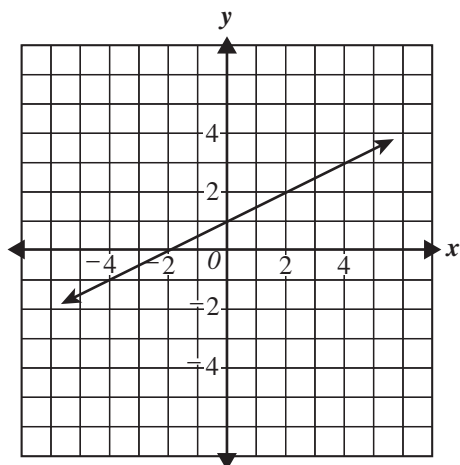
Multiply the left and right sides of the equation first by 8 and then by 5, so that the equation will no longer contain fractions. When multiplying the 8 and then the 5, be sure to distribute these numbers to each term in the equation. Therefore, the correct answer is **B**.

1A6.0 Students graph a linear equation and compute the x - and y -intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$). [1 graphing item; 1 computing item] (Note: The crossed out portion will not be tested on the CAHSEE.)

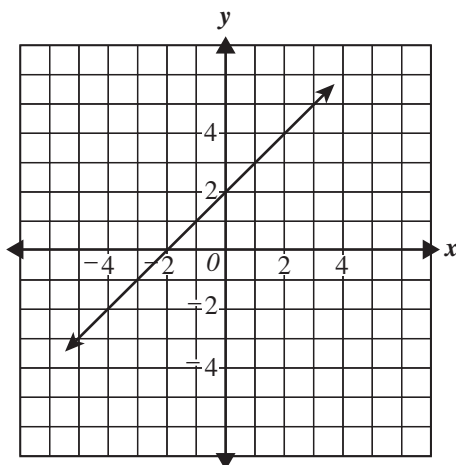
Sample CAHSEE Question

Which of the following is the graph of $y = \frac{1}{2}x + 2$?

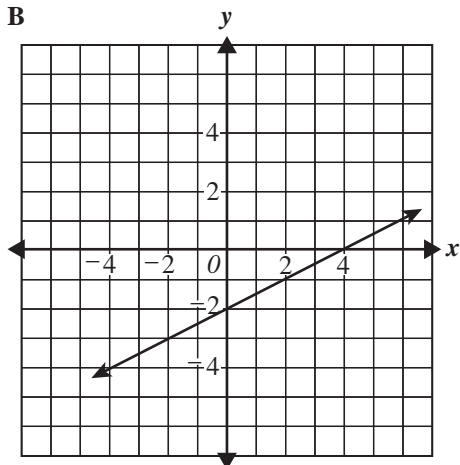
A



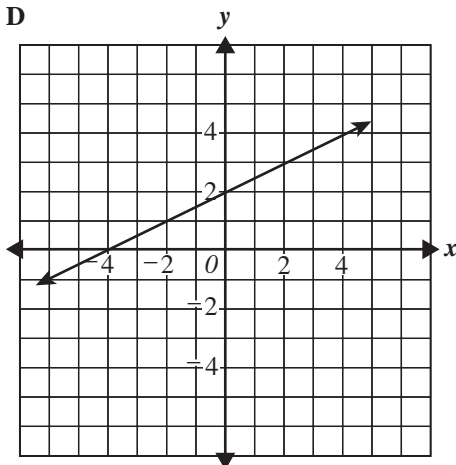
C



B



D



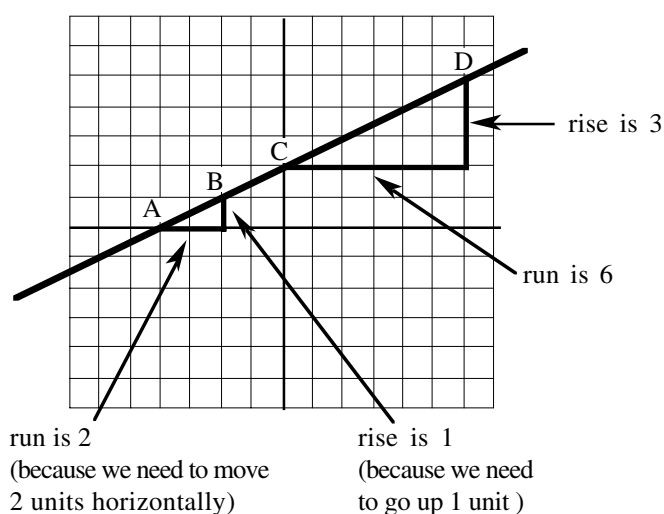
1A6.0 Sample CAHSEE Question cont'd

Mathematical Solution

- The correct answer is **D**. Please refer to the next column for a description of the solution.

Descriptive Solution

Notice that the equation $y = \frac{1}{2}x + 2$ is in “slope-intercept form” for linear equations where the slope is $\frac{1}{2}$ and the y-intercept is at 2. Which graphs have a slope of $\frac{1}{2}$? In a graph we can find the slope by looking at the ratio “rise over run.” If we pick any two points on the line, we can look at the vertical and horizontal changes to find the slope:



To move from point A to point B on the line, the ratio of rise to run is $\frac{1}{2}$. For a line, the slope ratio always reduces to the same fraction, no matter which two points are selected. To move from point C to point D on the line, the ratio of rise to run is $\frac{3}{6}$, which still equals $\frac{1}{2}$. Looking back at the answers to this CAHSEE question, you can see that graphs A, B, and D all have slopes of $\frac{1}{2}$. But graph C has a slope of 1, so we know it is not the correct answer.

Next we need to look for the correct y-intercept. Which graph has a y-intercept of 2? Not graph A; its y-intercept is at 1. Nor graph B; its y-intercept is at -2 . But graph D does have a y-intercept of 2. Therefore, the correct answer is **D**.

1A7.0 Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula. [1 question]
 (Note: The crossed out portion will not be tested on the CAHSEE.)

Sample CAHSEE Question

Which of the following points lies on the line $4x + 5y = 20$?

- A (0, 4)
- B (0, 5)
- C (4, 5)
- D (5, 4)

M02565

Mathematical Solution

- Start with the first point (0, 4) and substitute x and y values into the equation $4x + 5y = 20$.

$$4(0) + 5(4) = 20$$

$$0 + 20 = 20$$

$$20 = 20$$

- Yes! Therefore, the correct answer is **A**.

Descriptive Solution

We can test each point's coordinates in the equation $4x + 5y = 20$ and see which one works. Let's start with choice D and work backwards.

(5, 4) Does $4(5) + 5(4) = 20$? No.

(4, 5) Does $4(4) + 5(5) = 20$? No.

(0, 5) Does $4(0) + 5(5) = 20$? No.

(0, 4) Does $4(0) + 5(4) = 20$? Yes! So the correct answer is **A**.

1A8.0 Students understand the concepts of parallel lines and perpendicular lines and how their slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point. [1 question]
(Note: The crossed out portion will not be tested on the CAHSEE.)

Sample CAHSEE Question

Which of the following could be the equation of a line parallel to the line $y = 4x - 7$?

A $y = \frac{1}{4}x - 7$

B $y = 4x + 3$

C $y = -4x + 3$

D $y = -\frac{1}{4}x - 7$

M02651

Mathematical Solution

- The correct answer is **B**. Please refer to the next column for a description of the solution.

Descriptive Solution

Parallel lines must have the same slope. The equation given to us, $y = 4x - 7$, is in slope-intercept form with a slope of 4. The four possible answer choices are also in slope-intercept form. Notice that only the equation of choice B has a slope of 4. Choice **B** is the only equation whose graph is parallel to $y = 4x - 7$, making it the correct answer.

1A9.0 Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets. [1 question]

Sample CAHSEE Question

$$\begin{cases} y = 3x - 5 \\ y = 2x \end{cases}$$

What is the solution of the system of equations shown above?

- A** $(1, -2)$
- B** $(1, 2)$
- C** $(5, 10)$
- D** $(-5, -10)$

M02649

Mathematical Solution

- We can solve this system of equations using the substitution method and solving for x first. Since both equations are equal to y , set them equal to each other.

$$\begin{aligned} y &= 3x - 5 \text{ and } y = 2x \\ \text{therefore, } 3x - 5 &= 2x \end{aligned}$$

- Solve the resulting equation for x .

$$\begin{array}{r} 3x - 5 = 2x \\ -2x \quad -2x \\ \hline x - 5 = 0 \\ +5 +5 \\ \hline x = 5 \end{array}$$

- Now substitute $x = 5$ for one (or both) of the given equations and solve for y .

$$y = 3x - 5 \rightarrow y = 3(5) - 5 \rightarrow y = 15 - 5 \rightarrow y = 10$$

$$\text{or } y = 2x \rightarrow y = 2(5) \rightarrow y = 10$$

So $(5, 10)$ is the solution to the system.
Therefore, the correct answer is **C**.

Descriptive Solution

We can solve this system of equations using the substitution method and solving for x first. Since both equations are given in terms of y , set them equal to each other. The resulting equation is $3x - 5 = 2x$. Solving for x , you get $x = 5$. In order to find the y -value, substitute $x = 5$ for one or both equations and solve for y . So,

$$y = 3x - 5 \rightarrow y = 3(5) - 5 \rightarrow$$

$$y = 15 - 5 \rightarrow y = 10 \text{ or}$$

$$y = 2x \rightarrow y = 2(5) \rightarrow y = 10.$$

The result is the ordered pair $(5, 10)$.
Therefore, the correct answer is **C**.

1A10.0 Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques. [1 question]

Sample CAHSEE Question

Simplify.

$$\frac{4x^3 + 2x^2 - 8x}{2x}$$

- A** $2x^2 + x - 4$
- B** $4x^2 + 2x - 8$
- C** $2x^2 + 2x^2 - 8x$
- D** $8x^4 + 4x^3 - 16x^2$

M03354

Mathematical Solution

- In order to simplify, divide each term in the numerator by the denominator.

$$\frac{4x^3 + 2x^2 - 8x}{2x} \rightarrow \frac{4x^3}{2x} + \frac{2x^2}{2x} - \frac{8x}{2x} \rightarrow$$

- Using exponent rules,

$$2x^{3-1} + x^{2-1} - 4x^{1-1} \rightarrow 2x^2 + x^1 - 4x^0 \rightarrow$$

$$2x^2 + x - 4$$

Therefore, the correct answer is **A**.

Descriptive Solution

In order to simplify, divide each term in the numerator by the denominator. Since this item contains exponents, be sure to apply the rules of exponents correctly. In order to start, you may rewrite the expression

$$\text{as } \frac{4x^3}{2x} + \frac{2x^2}{2x} - \frac{8x}{2x}. \text{ Next, divide the}$$

coefficient and exponent of each term.

This will result in $2x^{3-1} + x^{2-1} - 4x^{1-1}$.

Don't forget to simplify the exponents as well. The result is $2x^2 + x^1 - 4x^0$. Only

a few more exponent rules to remember:

$x^1 = x$ and $x^0 = 1$. Simplifying this, you

get $2x^2 + x - 4$. Therefore, the correct

answer is **A**.

1A15.0 Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems. [1 question]

Sample CAHSEE Question

Diane delivers newspapers for \$5 a day plus \$0.04 per newspaper delivered. Jeremy delivers newspapers for \$2 a day plus \$0.10 per newspaper delivered. How many newspapers would Diane and Jeremy each need to deliver in order to earn the same amount?

- A** 30
- B** 50
- C** 75
- D** 83

M02614

Mathematical Solution

- Write an equation based on what was given and set them equal to each other, since we are looking for them to earn the same amount. Let n equal the number of newspapers they each need to deliver.

$$\$5 + \$0.04n = \$2 + \$0.10n$$

- Solve the equation for n .

$$\begin{array}{r} \$5 + \$0.04n = \$2 + \$0.10n \\ -\$2 \qquad \qquad -\$2 \\ \hline \end{array}$$

$$\begin{array}{r} \$3 + \$0.04n = \$0.10n \\ -\$0.04n \qquad -\$0.04n \\ \hline \end{array}$$

$$\begin{array}{r} \$3 \qquad \qquad = \qquad \$0.06n \\ \$0.06 \qquad \qquad \$0.06 \\ \hline \end{array}$$

$$50 = n$$

Therefore, the correct answer is **B**.

Descriptive Solution

We must first analyze the question to see what is being asked. We need to find out how many newspapers that Diane and Jeremy each need to deliver in order to earn the same amount. We will need to set up expressions based on what is given and set these expressions equal to each other to create an equation. Since we are looking for the number of newspapers, we need to create a variable for our equations. Let's name our variable n , since it stands for the number of newspapers. The expression for Diane will be $\$5 + \$0.04n$, since she gets paid \$5 a day plus \$0.04 for each newspaper she delivers. The expression for Jeremy will be $\$2 + \$0.10n$, since he gets paid \$2 a day plus \$0.10 for each newspaper he delivers.

Now that we have the expressions, let's set them equal to each other so that we can find the number of newspapers they need to deliver to earn the same amount.

$$\$5 + \$0.04n = \$2 + \$0.10n$$

In order to solve for n , we should first subtract \$2 from both sides of the equation and then \$0.04 from both sides of the equation so that we can get n on one side. We should then divide each side of the equation by \$0.06 to get n on one side.

$$\frac{\$3}{\$0.06} = \frac{\$0.06n}{\$0.06}$$

The result is $n = 50$. Therefore, the correct answer is **B**.

USING ALGEBRA I STANDARDS IN A REAL-LIFE SITUATION

The remaining 2 Algebra I standards are illustrated by a real-life problem, *Restaurant Advertising*.

Try to do this problem before you look at its solution.



Restaurant Advertising

The manager of a restaurant has a total of \$725 to spend on advertising. The advertisement for the restaurant will be a copy of the menu that costs \$0.50 each to print. The manager will pay a total of \$250 for an employee to distribute the advertisements in different parts of the city. Based on this information, how many total menus can be printed so that the manager spends exactly \$725?

Restaurant Advertising Solution and Standards

Step 1: Write an equation based on the given information.

Now we can create an equation based on the information we were given. The question is asking us to find the total menus that can be printed, so we can let m represent the number of total menus.

Each menu costs \$0.50 to print so we will need to multiply that by the total number of menus, m in this case. We must also remember that it is going to cost \$250 to pay an employee to distribute the menus. The total amount the manager can spend is \$725 so,

$$\$0.50m + \$250 = \$725$$

Step 2: Solve the equation for m .

$$\$0.50m + \$250 = \$725$$

Subtract \$250 from both sides of the equation.

$$\begin{array}{r} \$0.50m + \$250 = \$725 \\ -\$250 \quad -\$250 \\ \hline \$0.50m \qquad = \$475 \end{array}$$

Continue, to solve for m .

$$\$0.50m = \$475$$

7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).
[2 questions]

1A2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, and taking a root, and raising to a fractional power. They understand and use the rules of exponents.
[1 question]

ALGEBRA I

1A5.0 Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
[1 question]

Divide both sides of the equation by \$0.50.

$$\frac{\$0.50m}{\$0.50} = \frac{\$475}{\$0.50}$$
$$m = 950$$

So, the manager can have 950 menus printed for \$0.50 each and pay an employee \$250 to distribute the menus for a total of \$725.

Now that you've read about all the Algebra I standards, it is time to answer the questions in the next section and then check your answers using the answer key provided in the appendix at the back of this Study Guide.

(Note: The CAHSEE questions used as examples throughout this Study Guide are questions that were used on prior CAHSEEs. These items will not be used in future CAHSEEs.)

ADDITIONAL ALGEBRA I SAMPLE QUESTIONS

1. The perimeter, P , of a square may be found by using the formula $\left(\frac{1}{4}\right)P = \sqrt{A}$, where A is the area of the square. What is the perimeter of the square with an area of 36 square inches?

A 9 inches
B 12 inches
C 24 inches
D 72 inches

M00057

2. Assume y is an integer and solve for y .

$$|y + 2| = 9$$

A $\{-11, 7\}$
B $\{-7, 7\}$
C $\{-7, 11\}$
D $\{-11, 11\}$

M02242

3. Which of the following is equivalent to $4(x + 5) - 3(x + 2) = 14$?

A $4x + 20 - 3x - 6 = 14$
B $4x + 5 - 3x + 6 = 14$
C $4x + 5 - 3x + 2 = 14$
D $4x + 20 - 3x - 2 = 14$

M02936

4. Solve for x .

$$5(2x - 3) - 6x < 9$$

A $x < -1.5$
B $x < 1.5$
C $x < 3$
D $x < 6$

M02938

5. What is the y -intercept of the line $2x - 3y = 12$?

A $(0, -4)$
B $(0, -3)$
C $(2, 0)$
D $(6, 0)$

M02591

6. What is the slope of a line parallel to the line $y = \frac{1}{3}x + 2$?

A -3
B $-\frac{1}{3}$
C $\frac{1}{3}$
D 2

M02565

ADDITIONAL ALGEBRA I SAMPLE QUESTIONS

$$\begin{cases} 7x + 3y = -8 \\ -4x - y = 6 \end{cases}$$

7. What is the solution to the system of equations shown above?

- A $(-2, -2)$
- B $(-2, 2)$
- C $(2, -2)$
- D $(2, 2)$

M02956

8. Mr. Jacobs can correct 150 quizzes in 50 minutes. His student aide can correct 150 quizzes in 75 minutes. Working together, how many minutes will it take them to correct 150 quizzes?

- A 30
- B 60
- C 63
- D 125

M03000